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MINES - Geological Survey of India - 'An inspection Note on the Tungabhadra Dam site' by Mr. M.S.Venkataram, Geologist - Recorded.

AN INSPECTION NOTE ON

THE TUNGABHADRA DAM SITE (MAY 1948)

By

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Geologist, Geological Survey of India.

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(May 1948)

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INTRODUCTION.

At the request of the Chief Engineer Special, Madras, a brief period in May 1948 was spent in inspecting the foundation trench of the Tungabhadra dam alignment, with particular reference to the following sections:-

i) between L.S.1213 and L.S.1718;
ii) excavation foundations between Hoya channel and river margin, i.e. between L.S.2300 and L.S.2850;
iii) between L.S.2710 and L.S.2730;
iv) between L.S.2730 and L.S.2850;
v) certain portions of the dam alignment on the Hyderabad side

The cores recovered from a bore hole put down at L.S.172 were also examined and advice regarding the alignment of the section between L.S.0. and L.S.250 was also offered.

Suggestions regarding the nature of the final surface to be given to the top portion of the rock to receive masonry and about the distribution, location and depth of the grout holes, and the extent of grouting needed in the foundation trench were also given personally by me at the time of my inspection and are also repeated elsewhere in this note.

Right flank end of the dam.- The bore hole at L.S.172 has reached a vertical depth of 50 feet exposing the following section:-

Depth.	Nature or rock.	Remarks.
m.s.l 1593.42 to 1580.92.	..	No core.
1580.92 to 1578.67	Hard white quartz with pink felspar	
1578.67 to 1577.42	Hard white quartz with specks of mica	
1577.42 to 1566.92	...	No core.
1566.92 to 1563.92	Badly jointed and crushed, but fairly hard grey epidiorite.	
1563.92 to 1552.92	...	No core.
1552.92 to 1543.92	Sparsely jointed hard grey epidiorite.	Here the core specimens show a few perceptible joints in the top 5 ft.

As hard rocks have been encountered in this boring below m.s.l.1552.92 it may be possible to found the dam along the original alignment itself, provided the following precautions are taken:-

1) by grouting thoroughly any joints or other fractures in the rocks,

ii) by taking the foundation at least 5 feet into the hard rock, i.e., down to m.s.l. 1547.92 and

iii) arranging to tie the end of the flank of the dam firmly into the hill side.

Longitudinal sections.- Between L.S.1213 and L.S.1718 weathered pegmatitie is still being found in most places. Further excavation to the original objective depth of 1525 in the softer portions is necessary, leaving the harder sections as broad humps. (see Table for details).

Between L.S.2300 and L.S.2500 there is a median hump of hard epidiorite flanked by slightly jointed epidiorites. Here the depth reached varies between m.s.l.1522 and 1527 in the hard humpy portion, to about 1521 in the front cut off channel portion and to 1524 in the rear bucket portion. It would be enough if the hard hump is dressed down, but the front cut off portion should be excavated to another 5 feet to expose suitable foundation rocks. A further inspection is necessary to decide whether the bucket portion of the dam could be sited at the objective depth namely m.s.l.1516, now suggested by the Madras Engineers.

To ascertain whether the reddish pegmatite vein exposed between L.S.2710 and L.S.2730 increases in size at depth two bore holes are suggested to be put down on either side of this vein. If it is found that this vein dies out within shallow depths it would be enough if it is removed completely till hard rocks are exposed and the gap so formed filled in effectively with concrete.

The major portion of the dam alignment between L.S. 2750 and L.S.2850 is now on hard epidiorite which are separately jointed. It may suffice to take it down to another 2 to 4 feet i.e. to m.s.l. 1512. It would of course be highly desirable to go down until the joints close up but as it is expected that rocks free from any perceptible joints would occur here only at considerable depths, it would be enough if these minute joints are grouted well.

General considerations:- From a close examination of the foundation rocks exposed in the dam alignment it is suggested that the grout holes should be located at intervals of 20 feet and carried down to at least 10 feet in hard rocks and about 50 feet in comparatively softer and badly jointed rocks; the grouting should be at pressures varying between 80 and 100 lbs.

It would be best if the final surface of the foundation trench is stepped so that it would bond well with masonry.

HYDERABAD SIDE.

Between L.S.4150 and L.S.4200 (H.L.S.*6400 to 6350) the dam alignment is on white hard pegmatites which are practically free from cleavage cracks and other fissures. The excavation here has gone down to m.s.l.1515. As there are small fissures in places it would be advisable to minimise the effect of such cracks by excavating deeper, say 2 or 3 feet, in such places.

In the section between L.S.4300 and L.S.4350 (H.L.S.6250 to 6200) the excavation has gone down to m.s.l 1920 and the dam alignment is on the junction between the pegmatite and epidiorite. Here the epidiorite is hard but much jointed. It is suggested

that excavations should be taken down to the level of the pegmatite in the previous section viz., m.s.l.1515.

The foundation excavations between L.S.4350 and L.S. 4400 (H.L.S.6200 to 6150) have been taken down to 1520 in hard epidiorite which is somewhat weathered. The weathered portion of the flank should be completely stripped.

Between L.S.4400 and L.S.4450 (H.L.S.6150 to 6100) jointed hard epidiorite is exposed. This has been excavated down to M.s.l. 1540 and the Hyderabad Engineers propose to stop further excavation in this portion. As the rock here is quite hard and only sparsely jointed, it would be enough if this portion is dressed down to receive the masonry. At H.L.S. 6150 in the rear portion of the dam alignment the junction between the pegmatite and the epidiorite should be thoroughly cleaned and well grouted.

Dark grey jointed epidiorite with thin layers of soft flaky rocks occurring between L.S.4450 and L.S.4500 (H.L.S. 6100 to 6050) show polished faces at places. Here the present excavation level is at m.s.l. 1553. The foundation level should be taken down to 1550 in order to see whether this soft material disappears at depth and if so it would be necessary to carefully pick out such portions and grout them effectively.

Between L.S.4550 and L.S.4600 (H.L.S.6050 to 5950) the excavations show jointed but fairly hard, dark grey epidiorite. The excavation level here is m.s.l.1570. It is proposed to take it down by another 5 feet i.e. to m.s.l.15 The portions of this section where the rocks are hard and practically free from joints have to be only slightly dressed while in the softer portions further excavation is necessary to reach sound rocks below:-

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*H.L.S. - Longitudinal section as measured form the Hyderabad end.

GOVERNMENT OF MADRAS.
Abstract.

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DEVELOPMENT DEPARTMENT.

G.O.Ms.No.4940 Dated 4th October 1948.

Read: From the Deputy Director, Geological Survey of India, No.5580 M/1579(1), dated 6th September 1948.

ORDER:

RECORDED.

Sd/- x x
Secretary to Government.

To the Board of Revenue.
To the Director of Industries and Commereed.
To the Special Chief Engineer (Irrigation).

(True copy)

S. Jayaseelan
24/3.

KRVD.8.1. OFFICE ASSISTANT, M.R.O.

No.
27/3/54

Descriptive notes on foundation excavation.

Location Longitudinal Section in feet.*	Present excavation level m.s.l.	Name of rock exposed.	Suggested level of excavation m.s.l	Remarks.
1	2	3	4	5
L.S. 188 to 238	1567	Jointed weathered epidiorite		
238 to 448	1561	Badly jointed and highly weathered epidiorite.		
448	1560	-do-		
468	1559.9	-do-		
488	1549	-do-		
520	1539	Jointed, but fairly hard epidiorite.		
538 to 588	1534	-do-	1530	
588 to 738	1535	-do-	1533	
738 to 896	1528	Jointed, hard epidiorite	1525	
896 to 950	1525.5	Jointed, soft epidiorite with much weather pockets		
950 to 1003	1525	Much weathered epidiorite		
1003	1525	Mainly decomposed pink pegmatite.		
1003 to 1200		No excavation.		Basavanna channel section.
1200 to 1238	1540	Portions show weathered pegmatite	1525	

1	2	3	4	5
1238 to 1288	1535	Part of dam alignment on weathered pegmatite and part on weathered epidiorite	1525	
1238 to 1426	1532.5	Part of dam alignment on weathered pegmatite and part on weathered epidiorite	1525	
1288 to 1426	1533	-do-		The excavation has to be taken d to reach hard sound rock.
1426 to 1538	1541	Fairly hard pegmatite in the centre with weathered epidiorite on either side.		The excavation should be taken d to 1539 in the hard pegmatite an 1525 in the softer portions.
1538 to 1598	1541 (average)	Hard pegmatie		The occasional weathered pockets will have to be removed.
1620	1538	-do-		
1620 to 1688	1542 (Rear) 1533 (Front)	-do-		Hard pegmatite in the rear conta a few fissures and crevices whic will have to be removed and excav tion taken down to 1535
1688 to 1718	1533	Jointed, but hard epidiorite	1528	
1718 to 1758	1533	-do-	1528	
1758 to 1838	1537 (Rear) 1532)(Front)	Jointed and weathered epidiorite.		The excavation should be further taken down to reach sound rocks.
1838 to 1950	1534(average)	-do-		-do-
1950 to 2013	1533 (average)	-do-		-do-
2013 to 2138	1534 (average)	-do-		-do-

Note:- Logitudinal section in feet measured from the Madras and towards Hyderabad. Total length of dam alignment as given on 20-5-1948 is 10,550 feet

1	2	3	4	5
2138 to 2250		No excavation.		
2250 to 2300		Rock not exposed.		
2300 to 2338	1524.5	Jointed, hard epidorite		
2338 to 2500	1525 (average)	Sparsely jointed, hard epidiorite		See page 2 of note.
2500 to 2600	1518	-do-	1515	
2600 to 2700	1514	-do-	1512	
2700 to 2870	1514	Jointed, fairly hard epidiorite	1512	

HYDERABAD SIDE.

L.S.3700 (H.L.S.6850)	1513	Fairly hard, but slightly jointed dark grey epidiorite.	Weathered portion should be stripped and the foundation level may be taken down by 1-2 feet more in the hard rock
3950 (H.L.S.6600)	1510-1511	Mostly hard, dark grey epidiorite with a show of pegmatite at the south-east end.	
L.S.4150 to 4200 (H.L.S. 6400-6350)	1515	Hard pegmatite	See page 4 of note.
L.S.4300 to 4350 (H.L.S.6250-6200)	1520	Portions show pegmatite and portions show epidiorite.	See page 4 of note.
~~L.S.4350 to 4400 (H.L.S.6150-6100)~~	~~1540~~		

1	2	3	4	5
L.S.4350 to 4400 (H.L.S.6200 to 6150)	1530	Hard grey epidiorite, weathered in places.		See page 4 of note.
L.S.4400 to 4450 (H.L.S.6150-6100)	1540	Jointed, hard epidiorite		-do-
L.S.4450 to 4500 (H.L.S.6100-6050)	1553	Jointed, hard, grey epidiorite with thinx intercalations of rock.		-do-
L.S.4500 to 4600 (H.L.S.6050-5950)	1570	-do-		See page 5 of note.
L.S.4650 to 4700 (H.L.S.5900 to 5850)	1553 ~~1570~~	Fairy dark, soft epidiorite with thin veins of quartz		Should be excavated deep enough to catch sound rocks.
L.S.4700 to 4950 (H.L.S.5850-5600	1568	Jointed, soft epidiorite		-do-
L.S.4950 to 5050 (H.L.S.5600-5500)	1560	Jointed, soft epidiorite with much weathered pockets in the front portion.		-do-
L.S.5050-5150 (H.L.S.5500-5400)	1545	Front portion of dam alignment shows weathered epidiorite and rear portion shows fairly hard and loss jointed epidiorite with stringers of quartz.		
L.S.5150-5200 (H.L.S.5400-5350)	1540	Much weathered epidiorite.		
L.S.5200-5300 (H.L.S.5350-5250)		No excavation.		Koragal channel section.
L.S.5300-5500 (H.L.S.5250-5050)	1534	Jointed, soft epidiorite.		

1	2	3	4	5
L.S.5500-5750 (H.S.L.5050-4800)	1535-1540	Hard rocks not exposed, mostly soil.		
L.S.5750-5975 (H.L.S.4800-4575)		Shallow cuttings - weathered greenish epidiorite.		